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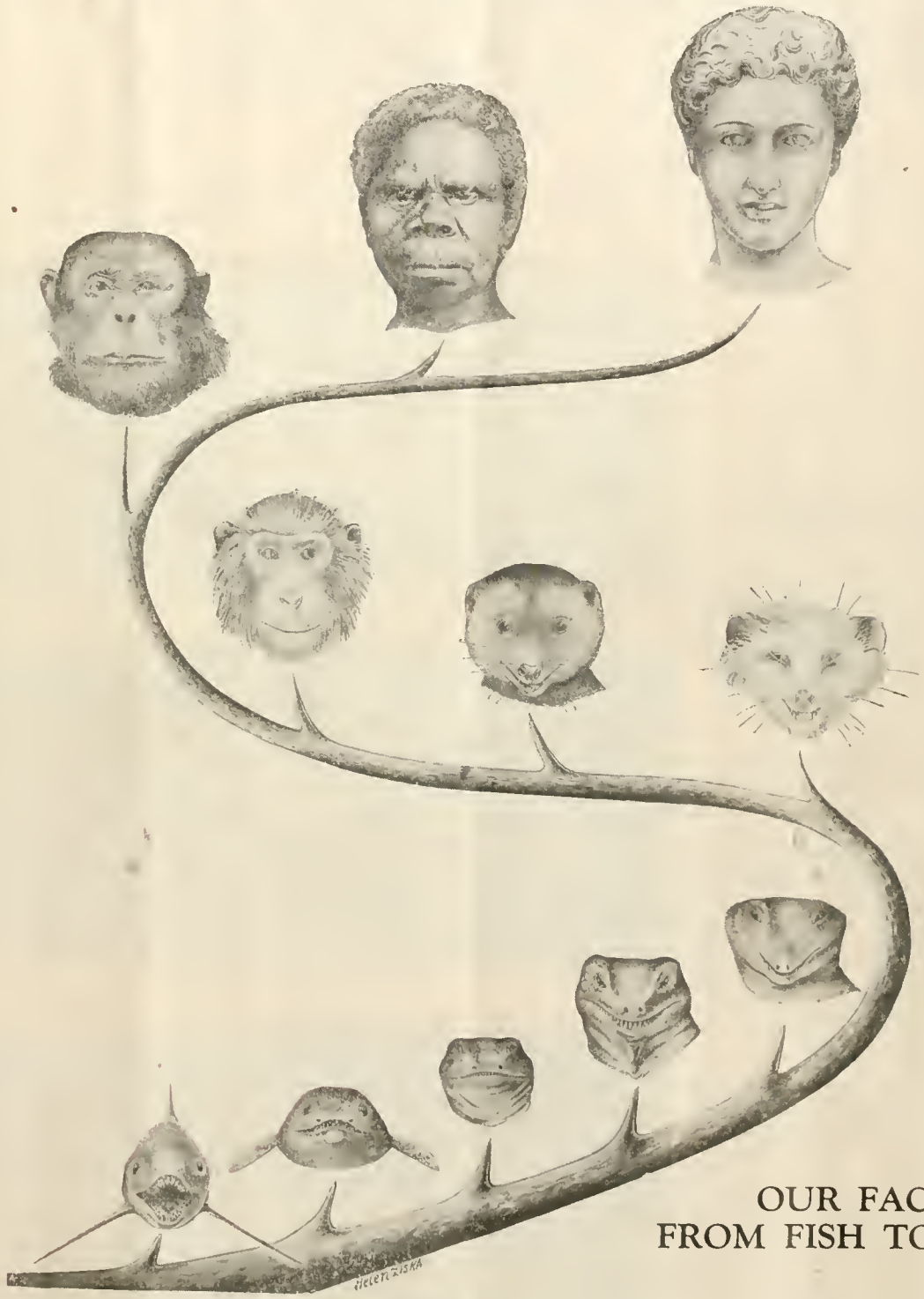

OUR FACE
FROM FISH TO MAN

From "Our Face from Fish to Man" — *By William K. Gregory* *Courtesy of G. P. Putnam's Sons*

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New Evidence of Man's Relationship To The Anthropoid Apes

(With Kind Permission from a Study in the Journal of Dental Research, April, 1928)

By J. LEON WILLIAMS

MANY years ago I made a critical study of tooth form in relation to race. The most obvious variations in human teeth occur in the upper central incisors. Examination of over one thousand specimens from all parts of the world showed wide and marked variations *in all races,* with only vague indications of racial peculiarities.

Arranging these teeth according to the most striking peculiarities and resemblances it soon became apparent that there are *three* very distinct forms of human central incisors. Class 1, with sides parallel for more than half their length; Class 2, with sides rapidly converging from the cutting edge toward the root; Class 3, with a double curve on one, and sometimes on both sides. The great majority are various blendings of these typal forms, but in most teeth one or the other is clearly dominant.

An examination of the skulls in the large collection of the Museum of the Royal College of Surgeons of London showed all three of these types of teeth in every racial group. The racial types of teeth which I had expected to find were non-existant. Instead, all races have three types of teeth, with certain minor racial variations. Subsequent study in other large museums and more than fifteen years experience in the examination of teeth in the mouths of living people have established this discovery beyond a doubt.

These same three types of teeth, even more strongly marked in their leading characteristics, are found in the gorilla, the orang-utan and the chimpanzee. As yet these variations have not been found in the teeth of any other animals. These facts have a direct bearing on the controversy now in progress as to the pre-human ancestors of man.

The accompanying photographs illustrate these statements. Figures 1, 2 and 3 are taken from three skulls of Sandwich Islanders. The first exhibits teeth of Class I, having proximal sides that are nearly parallel for more than half their length. The teeth in the second are of the tapering sort, Class II, characterized by sharply converging lines and consequently by wide interdental spaces. The third shows the double curved line on the distal proximal surface, Class III, also with wide interdental spaces.

I have similar sets of photographs of Australian, Ancient Egyptian, Kaffir, Chinese, African, New Hebridean, Hindoo, Spanish, German, Javanese, Fiji Islander, Italian, Tasmanian and others. They all prove conclusively that there is no single form of tooth characteristic of race. For half a century it was taught in college text books that certain forms of teeth are peculiar to certain temperaments. There is not the slightest foundation in fact for this teaching. All peoples, ancient and modern, have three types of teeth.

Furthermore, the previously held views that there is some particular tooth form characteristic of the anthropoid apes, has no foundation whatever in fact. They have the three types of teeth that we find in all human races, with even more strongly marked or bold characteristics. The accompanying illustrations, figures 4, 5 and 6 show all three types of teeth perfectly represented in the orang-utan. Studies of the gorilla and the chimpanzee show the same three tooth types.

How closely they resemble human teeth is shown by figures 7 and 8, showing teeth of Sandwich Islander and Gorilla. The left central incisor of the gorilla was lost. Over the black space in the enlarged print I pasted a photograph of the left central

Fig. 1. Sandwich Islander; Class I

Fig. 2. Sandwich Islander; Class II

Fig. 3. Sandwich Islander; Class III

incisor of the Sandwich Islander, Both in size and outline the variation is far less than in many human teeth of the same class, and no greater than in the centrals in the illustration beside it from which it was taken.

Most of the other special features which comparative anatomists have pointed out as common to man and the apes, and of such close resemblance as to give strong grounds for belief in a common origin, are so hidden away in the body that only experts in anatomy have first hand knowledge of them.

Fig. 7. Sandwich Islander; Class III

Fig. 8. Gorilla; Class III
Left central incisor of Sandwich Islander substituted for that of Gorilla showing remarkable similarity

But here, in the three types of teeth common to man and apes, we have a feature as open to the perception and understanding of the non-expert as to the trained scientist. The layman will not appreciate the full significance of what he sees, but he will understand enough to give the opponents of evolution an exceedingly difficult task to explain this new evidence away.

When this photographic evidence was submitted to Professor Ernst Haeckel he expressed himself as follows:

Fig. 4. Orang-utan; Class I

Fig. 5. Orang-utan; Class II

Fig. 6. Orang-utan; Class III

Jena 6, 1, 1913

Dr. Leon Williams,
London.

Dear Sir:—Your observations on the three different types of the upper central incisors are very interesting, and mainly the fact that the same three characteristic types occur also in the orang-utan and in other anthropoid apes. In my opinion this fact is another new and convincing proof for the near relationship between man and the anthropoid apes, and for the phylogenetic theories that both have been derived from one and the same common ancestor. First, the fact that these three types—in physiological relationship of little value—are so distinctly developed in three morphological directions seems to me an important proof that the way of phylogenetic divergence of characters is the same in man and in the anthropoid apes.

Very respectfully yours,
(Signed) ERNST HAECKEL.

With what admirable clearness and conciseness Professor Haeckel has gone straight to the mark in that letter! Three forms or types of teeth have no special physiological significance, as he says. But the morphological meaning conveys the story of man's origin.

In the face of this additional evidence of man's near relationship to the anthropoid apes, what can those say, who hold that "man's ape ancestry is becoming out of date"? I know of no shadow of evidence that man's immediate prehuman ancestors resembled wombats or kangaroos or any other animal known to science, and agree with the paleontologists who hold that the evidence is overwhelming that man's evolutionary ancestors were ape-like animals.

WHAT TO DO—IF YOU GET TWO

Since this issue is mailed to several lists of "prospective subscribers" which it was impossible to check against each other, it is unavoidable that some may receive two, and that some subscribers may get an "extra." In that case please accept it as an invitation to give it to a friend and secure another new subscriber.

Brains—How Come?

By ALLAN STRONG BROMS

IV.

ON the very first page of our family album appears a simple-looking fellow named Amoeba. He is only a speck of living jelly, microscopically small, and formless, without head or tail. He would be a regular lazy-bones if he had bones, for he moves only when hunger or danger prods him. Even then he just pokes around until he accidentally meets a dinner (which he leisurely surrounds) or a danger (which he leisurely avoids). Though nothing to brag of, he surely is of our ancestral stock.

Of course our family has changed a lot from this humble and certainly simpleminded beginning.

The first step in getting ahead was to get a head. As a start, one of the amoebas, the soil dwelling Naegleria gruberi made head and tail of himself. Usually he is just an amoeba, without shape or direction in life, but presently, for a few hours, he turns into a spindle-shaped thing with a head-end crowned by a luxuriant crop of two sensitive swimming-hairs. This end, being a head, travels ahead, bumps into things and needs and develops sensitiveness. This really makes a good beginning and several of the one-celled animals follow suit. Stentor, for instance, anchors by a stalk-end and lifts up its funnel-shaped sensitive head-and-mouth-end for food. When the one-celled evolved into the many-celled, the rule still held. The end that got the contacts, that moved ahead and took the bumps, got the brains.

Already, in the worms the head-end and a very primitive brain are clearly developed. This brain takes the bumps and passes bump messages along its nerves to the body muscles that respond with saving reactions of movement. Often the head-end meets food and sends food messages to the nearby muscles of mouth or tentacles that then respond with feeding reactions. So the head acquired the mouth, a chemical (taste-smell) sense and brain parts to go with them. Then the worm turned—into several sorts of animals, into insects, for example, and more or less directly, into primitive fishes. Just how, we are not sure, but our worm-family resemblance is still there when we are very young and unborn. As part of this development, eye-spots sensitive to light and shadow appeared, quite an achievement, of course, but after all only a sort of touch sensitiveness to finer wave vibrations pounding on the skin. Again the ahead end, where sensitiveness served best, got the receiving set of eyes and some more brain parts—nerves and nerve centers. By this time we were really getting a head.

Head and tail were now distinct. Movement was definitely forward, with occasionally a turning bend to right or left. Body shape and feet or fins were fitted to forward movement. Many of the lower animals moved indifferently in any direction, but now the rule was "head first," for movement was safer and faster that way. Position had become important to effective movement and there developed a group of position senses, among them a sense of balance. Its sense organ is located in the ear and consists of three semi-circular tubes lined with sensitive hairs and filled with a fluid that splashes back and forth when we move or tip, thus disturbing the hairs and our sense of balance or movement. These tubes register movement in three directions, for one is vertical from back to front, telling us when we tip forward or backward, the second vertical again, but set sidewise to catch movements in that direction, while the third is horizontal to tell us when we turn around. This is the one that gives us the dizzy feeling when we have been whirling rapidly around. For the enclosed liquid soon whirls with us and keeps right on when we stop, making us feel that we are still whirling. The business of this three-tube "labyrinth" is to keep track of our movements and balance, aided somewhat by the "feel" of our muscles and bones and by pressures on the soles of our feet.

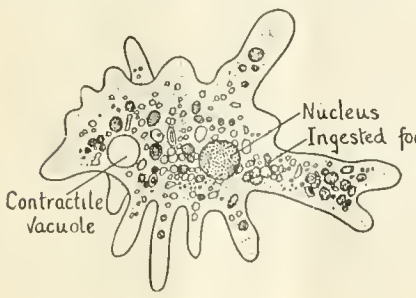
This balancing organ helped the fish keep right side up. Fishes are light-colored below and dark above. Viewed from below, they blend with the sky; viewed from above, they blend with the dark bottom. When they turn over a bit, you catch the white flash at once. The right position therefore helps the fish hide. But it also helps him move fast. Shape and muscle and fin are all fitted to forward movement, with swings to right or left.

But the fish has another position problem, it must head and swim upstream to avoid being swept down and away by the current. The eyes help, for the fish watches the banks and swims to keep abreast of familiar points, but it also has a pair of sense organs to register the water pressure and movement on each side. They are of course up front where the current presses and you and I would call them ears. At this stage, however, they are merely extra sensitive touch spots, somewhat new in structure and the way they work. If the fish turns aside, the water pressure on the upstream side increases and on the the other side decreases. In response, the fish swings up-stream until the pressures balance and he knows he is right with his world. The ears are therefore the upstream compass of the fish.

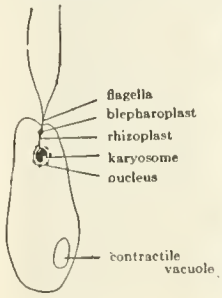
The same organ serves to detect water disturbances that may mean food or danger and therefore need attention. As there is a pair of wave-sensitive organs, the direction of the disturbance can usually be detected, the near spot feeling it more than the other. When later the fishes evolved into amphibians (our frogs being of this tribe) and other land animals, these two ear-spots, sensitive to water-waves, improved enough to detect the more delicate air-waves we call sound. This involved a better mechanism of the inner ear, new nerve connections and brain centers for hearing, and the growing of an outer ear, a sort of ear-trumpet to concentrate more sound waves on the real working ear inside, like your open hand cupped behind your ear to help you hear. Eventually we became acute enough of hearing to distinguish slight differences in sound, an important step towards speech which involves both recognizing and reproducing the sounds we hear. To say a real mouthful, we must first hear a real earful. Of that, more later.

Our organs of hearing and balance are found together because they began together as the position organs of the fish. Thus evolution solves another deep mystery.

The next number on our program will be "Babies for Better Brains". Oh Baby!

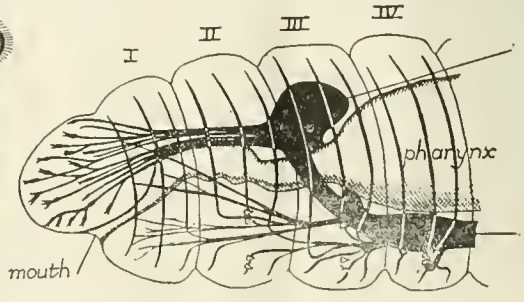


Amoeba,—no shape to brag of.



Naegleria,—with head end.

Stentor, with mouth stalk.



The "brain" of an earthworm. (In black)

Fossil Footprints

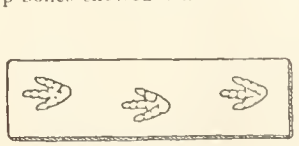
By Frederick A. Lucas,
Honorary Director, American Museum of Natural History

EMERSON'S saying that "Everything in Nature is engaged in writing its own history" applies aptly to those animals of yore that left their footprints on the sands of seashore, mud-flats of drying lakes or beds of shrunken watercourses. So too, worms burrowing in the sand, shell-fish trailing over mud at low tide, stranded crabs scuttling off to sea, all left their tell-tale records. Even falling rain and blowing wind disclosed the directions whence they came, or we may read in the record how turbid freshets swept down, perhaps after long drouths, when the sun had baked the drying lake bottoms.

Among the earliest signs of animal life on this globe are some long, dark streaks below the Cambrian in England, thought to be worm burrows filled with fine mud. Above these worm borings, in the middle Cambrian, we find abundant remains of the worms themselves and simple shellfish. From that time on there are tracks aplenty, made whenever conditions favored. We find tracks formed in sands alternately dry and submerged by tide or river, or in soft earth filled with sand or mud.

First came tracks of invertebrates—those worm burrows; curious, complicated trails of the king-crab kindred; broad-ribbed, ribbon like trilobite paths; even faint scratches of insects. Later came footprints of the back-boned tribe; shallow, palmed prints of salamanders; slender lizard sprawls, real footprints, big and little of the Dinosaur horde; and finally, miles above the Cambrian, marks of mammals. Often the footprints are all we have, but in some cases, as with the dinosaur Iguanodon, we also have the fossil foot to fit the print.

The now famous three-toed dinosaur tracks in the Connecticut valley "brownstone", first seen in 1802, were thought to be bird tracks and popularly called the tracks of Noah's raven. Dr. Deane first guessed the truth that they were due to other animals, partly because some prints showed four and five toes and the texture of the sole of the foot, unlike that of any known bird. Certain long tracks and heart shaped depressions made by hip-bones showed where some dinosaur squatted down to rest.



Dinosaur tracks

Where a dinosaur sat down.

This part of the Connecticut valley was a river bed or long narrow estuary running southward from Turner's Falls, Massachusetts, where the tracks are most clear and abundant, subject to sudden changes of water level, now left dry to bake in the sun and again covered with water depositing a layer of mud.

The wealth of animal life roaming this estuary may be gathered from the listing of over 150 species. Mere size is however no sure indication of differences in reptiles which grow continuously through their long lives. A single animal may have left his footprints over and over in assorted sizes.

The fine brownstone slab here illustrated measures three by five feet and shows 48 tracks of Protozoum Sillimanium and 6 of a lesser species. Quarried near Middletown in 1778, it did duty as a flagstone for sixty years, fortunately with the face down. When taken up for repairs, the tracks were discovered and it was transferred to Amherst College.

Footprints began to be noticed about 1830 in both England and America, in each case in Triassic rocks. The English tracks were from both dinosaurs and tortoises. Oddly, in both instances the tracks run from west to east, as along a customary migration route, but the animals themselves have not been found. From strata of similar age in the Rhine valley come marks so like a stubby hand that the animal was christened Cheirotherium, "beast with a hand" and taken for gigantic oppossum. But mammals had not yet arisen. The marks were due to giant salamander-like labyrinthodonts, found in the same strata.

Footprints may tell the attitude assumed by extinct animals. Some fine Iguanodon tracks from England and Belgium furnish conclusive proof that many dinosaurs walked erect. Made in soft soil into which the feet sank deeply, the impressions of the toes show very clearly. Had they walked flat footed as we do, long heel marks would have followed the toes. Their absence shows plainly that Iguanodons walked on their toes like birds. Where crocodilians and some short-limbed dinosaurs have crept along we find a continuous furrow between the foot-prints. Since none was found here, we may conclude that these great creatures carried their tails clear of the ground.

According to the papers, some footprints in the prison-yard at Carson City, Nevada, were made by primitive men of giant stature. They were such as *might* have been made by huge moccasined feet, the papers therefore concluding that they *were* so made. Similarly, Mammoth and Mastodon bones have been eagerly accepted as those of giants; a salamander was used as proof of the deluge; and the "petrified man" flourishes perennially. These prints were, however, those of some great ground sloth, a group ranging from Patagonia to Oregon. They looked like tracks of a bi-ped because the hind footprints usually fell upon and obliterated those of the fore-feet. But a few prints of the fore-feet were found, also indications of a struggle between two of the big beasts, for one set of imprints is deeper at the toes, the other at the heels, as if one animal pushed and the other resisted. Some broad depressions with marks of coarse hair show where one sloth sat on its haunches. This prison-yard also contains a great round "spoor" of a mammoth, the hoof prints of a deer and the paw-marks of a wolf(?), indicating that hereabouts was a pool where all these creatures came to drink.

Dinosaur footprints on Connecticut Valley Brownstone.
Courtesy Am. Mus. Nat. Hist.

The Proofs of Evolution

By HENSHAW WARD

(This is the last of a series of three articles. The proofs described in the previous articles are: I. The specialists are unanimous. II. What breeding proves, III. What the rocks prove, IV. What geography proves.)

V. WHAT STRUCTURES PROVE

THE breeders have proved that plants and animals can be altered—gradually, through a series of generations—to forms that are very different from the original ancestor. For instance: a small, single daisy growing wild in China has been made to evolve into a double chrysanthemum twenty inches in diameter; heavy draft horses and race horses have been evolved from a common ancestor; the tiny, feeble, hairless dog of Mexico and the fierce, stiff-haired police-dog evolved from a common ancestry. These evolutions are facts in human history, just as the evolution of certain shells is a fact in the rocks. The two lines of proof—from breeders' records and from geology—fit together.

And both these lines of proof agree with a third line—the facts recorded in the skeletons of animals. Suppose that we had before us a set of a hundred photographs of the changes that took place through a hundred generations in the breeding of a small, hairless dog. The first photograph would show a litter of five pups, and an arrow would point to one that was selected because it was slightly smaller and less hairy than the other four. The second photograph would show the son of this pup, slightly different from its father. The third photograph would show slightly more variation in the third generation, and so on to the final product in the hundredth generation. At no point would there be a greater difference between father and son than we are used to seeing in any family of animals, but the difference between the first father and his remote descendant would be amazing.

Now suppose that a second series of photographs showed another line of selection from the original litter, each generation being a trifle bonier and having stiffer hair than the one before it, till in the hundredth generation there was a descendant that resembled a police-dog. Put the two products of evolution side by side, and it seems a miracle that they descended from a common ancestor. Yet any producer of domesticated plants or animals could tell true stories from the history of breeding that are stranger than this imaginary case.

The differences between the feeble pet dog and the fierce police-dog—great as they seem—are all within limits. Each has four legs, two eyes, one nose and one tail. Each has the same number of toes, the same bones in its ears, the same number of sections in its backbone, the same kinds of teeth in its jaws. Therefore a special student of anatomy, if he saw the two skeletons mounted in a museum, would know absolutely that there is a close family resemblance between them. He would know that they are more closely related to each other than they are to a creature with a different sort of spine or a different outfit of teeth.

This one simple case illustrates the way in which anatomists can trace the line of descent in different kinds of animals, by comparing the structures of animals now living and by comparing the fossils of animals. If we see a seal swimming, we may think it is a sort of fish; but in its flippers we find the same five-finger structure that is in all warm-blooded animals and that is not in any fish; we find the same three leg-bones that are in man. We might suppose that a whale is a sort of fish; but it is a warm-blooded animal that suckles its young; its flippers contain the same five fingers and three arm-bones that we have; buried in the flesh of its tail are the remnants of leg-bones and toes. Since its structure is so similar to ours, we know that it is very much more closely related to us than any fish is.

The anatomists have discovered a fossil record of the evolution of the horse; it stretches back millions of years, through forms that get smaller and smaller, through forms that had two toes and four toes, back to an ancestor only a foot high. Almost as complete a series of fossils shows the evolution of the elephant from a snouted creature only three feet high.

These structures that are found in the rocks, and the structures of the animals that live today, are a record of alterations that have taken place in the course of thousands and millions of years.

VI. WHAT EMBRYOS PROVE

If the proofs in skeletons and islands and fossils all point strongly to the idea that plants and animals have come to their present forms by evolution, their combined evidence is very strong. Their strength is doubled when it is put with the proof that embryos furnish.

Every animal begins its life as a single cell that is too small to be seen with the naked eye. Every mouse and tiger and cow and man begins its career in a sac so small that the most powerful microscope cannot distinguish one kind from the other. This cell divides into two cells, each of these into two others, and so on until millions and billions of them have shaped themselves into an animal that lives inside the mother. This earliest stage of the individual's life is called an embryo. When the embryo of a chick is a few days old in the egg-shell, it does not look like a fowl; it looks like a gill-breathing fish. Also the embryo of a calf or of a rabbit looks like a fish. Also the embryo of a man looks like a fish. The most learned professor in a medical school could not tell, in the earliest stages, whether an embryo is to develop into a rooster or a man.

Every embryo of a warm-blooded animal goes through a development—in its own short career of a few weeks or months

Parallelism in the embryonic developments of various animals. —*From Hird after Haeckel.*

—that is like the evolution of millions of years which is recorded in the rocks. Every man at the beginning of his life had a fish-like structure, and later a reptile-like structure. Much later he was a hairy, ape-like creature. His career of nine months in his mother's womb is like a swift moving-picture of the progress that the fossil record says his ancestors went through in the course of half a billion years.

A careful thinker might be cautious and slow about believing the fossil record in the rocks; for it is not complete and it might be misleading. A careful thinker might hesitate about the record that is reeled off in every embryo—if it was alone in the world and no other evidence told the same story. But what should the most wary thinker decide when he finds that rocks and embryos tell the same history?

Make the case vivid to yourself and get the force of it by supposing that the two lines of proof were revealed to two men on opposite sides of the world. Suppose that a Russian geologist, after ten years of study, had been able to map all the vast pile of knowledge of fossils that it has taken thousands of men two centuries to accumulate. And suppose that an Australian physician could have learned in the same ten years the whole great fund of knowledge of embryos that thousands of physiologists have acquired by a century of toil. Each of these men would marvel and be wary. They would not want to run any risk of being ridiculed by envious rivals for hasty conclusions. But suppose that they happened to meet each other and compared notes. Could they any longer distrust the evidence that came through their two pairs of eyes? The specialists in many departments of the study of life have been comparing notes in that way for the past fifty years. They have unanimously decided that the combination of proofs is absolutely convincing. If they are wrong, the world is a senseless whirligig. If they are right, the world is an orderly and rational place.

VII. What Blood Proves

If a witness tells a falsehood in a courtroom, and if honest witnesses can then be found who will, one after another, tell what facts they know, the falsehood will be disclosed. But if a witness tells the whole truth, no other truthful witness exists under the whole heaven who can contradict any particle of the truth.

If evolution had been false, every recent discovery in geology and medicine would have contradicted evolution. The theory would have died long ago. But the fact is that no recent discovery of science contradicts evolution. The more new knowledge we acquire, the more witnesses we have to the truth of evolution.

The latest and most dramatic proof comes from the blood of animals. It has long been known that blood confirms one of the strangest parts of the evidence from the rocks—that birds are descended from reptiles. The warm-blooded feathered creatures, so unlike reptiles in appearance and temperature, have in their veins the tell-tale evidence of who their ancestors were.

Twenty-five years ago an English chemist learned how to cultivate in a rabbit's blood an anti-toxin that would give an unmistakable reaction when the blood of a horse was mixed with it. Blood from a relative of the horse, such as a mule or zebra, would also give the reaction, but a slighter one. Blood from a more distant relative, such as a cow, gave a much slighter reaction. A long series of most rigorous experiments was made with the blood of many sorts of animals.

Now blood is a more essential part of an animal's make-up than a skeleton is; it reveals family likenesses much more surely. The evidence from blood proves conclusively what man's nearest relative is: it is the chimpanzee. Thus evolution, already proved beyond doubt, has been proved once more.

Scientists at Work—Wm. K. Gregory

By Horace Elmer Wood, II

THE man in the street would probably place Professor W. K. Gregory by remembering the newspaper account of a recent controversy in which he stood on the side of Darwin and the ape-man, as opposed to Professor Osborn's advocacy of an as yet undiscovered dawn-man. This controversy, however, is merely the by-product of the most recent of a long series of investigations covering the last quarter of a century.

Dr. Gregory's work is morphological, rather than experimental. It involves the careful comparison of all available relevant specimens and data, noting resemblances and differences. Following this first stage of observation, one or more possible explanations of the facts are developed, what is known as a working hypothesis, or if more than one, multiple hypotheses. (It is the hypothesis which the late William Jennings Bryan stigmatized as "merely a guess"). This hypothesis is then tested out on the data, including, if possible, additional material besides that on which it was founded. If it still stands the test, it may be accepted, tentatively, its degree of probability resting on the amount and kind of evidence. It must still, of course, stand up under the criticism of other scientists, working in the same or adjoining fields, before it can be regarded in any sense, as accepted. That Dr. Gregory's extensive work usually does stand up is the basis of his scientific standing.

The doctor's thesis, in the sciences, usually is a relatively modest piece of research, an article involving a relatively limited problem, undertaken, in most cases, in a painstaking, but often slightly amateurish fashion. It is characteristic of Dr. Gregory that, for his doctor's thesis, he wrote "The Orders of Mammals", covering the structure and interrelationships of all the major groups of mammals. This is still, nearly twenty years later, the standard book on the subject. In such a period, most scientific work is either disproved, relegated to the stacks as unimportant, or completely absorbed in the march of science.

His studies on the comparative anatomy and evolution of the vertebrate skull and limbs represent another high-light. Students are looking forward eagerly to the appearance of his promised book "The Face from Fish to Man", which will summarize the main stages in our evolution. One such summary view appears on the cover of this issue.

There is nothing to thrill the tabloid press in a careful, day in and day out, comparison of the crown pattern of the teeth of one individual or species with another, until each elevation and depression has its own personality, and can be traced through its changes from one geological level to another. Yet it is just these studies which have enabled Dr. Gregory to furnish the final links and corrections in the story of the evolution of the teeth of mammals as a group, and of most lines of mammals, man included. This has led to his work on the general problem of the evolution of man—in which field he is easily the leading American authority.

It is noteworthy that Dr. Gregory is a specialist in several widely separated fields, any one of which would usually furnish a life-time employment for an able man. His linking together of previously unconnected, though logically interrelated fields, has knitted together zoology and paleontology, and emphasized the common heritage of such diverse vertebrates as mud-fish and revivalist.

In addition to the preparation of his large number of valuable publications, Dr. Gregory has time to be Curator of Comparative Anatomy in the American Museum of Natural History. More recently, as Curator of Fishes, in addition, he has been organizing the new "Hall of Fishes". He is also Professor of Vertebrate Paleontology at Columbia University. It is, in the long run, a fair test of a teacher to ask who his students are. A surprising number of leading younger scientists in the fields of zoology and paleontology studied under Dr. Gregory.

Henshaw Ward, in an article in number six of this journal, described an instance (the Hesperopithecus problem) illustrating Dr. Gregory's scientific integrity. To those who know him, it is a question whether this, or his unfailing understanding and kindliness, is the more outstanding feature.

EVOLUTION

A Journal of Nature

To combat bigotry and superstition and develop the open mind by popularizing natural science

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LET'S CO-OPERATE

"The new attitude toward science on the part of the people as a whole must be met by a corresponding broadening of interests and contacts on the part of research workers. It is only through the window of the press that the people as a whole view science. It is the duty of the scientific workers to assist in helping to make the picture clear and comprehensive," Science, Nov. 30, 1928.

EVOLUTION was established to serve as a useful medium in this effort to "make the picture clear and comprehensive." While it is always strict regarding facts to merit the support of scientists it is also clear and popular in style to be understood by ordinary folk. It is small enough so that none will argue "I haven't time to read it"; cheap enough so none will say "I cannot afford it." Many are taking bundles of it to spread among their neighbors. The rapid growth of circulation during its short existence, in spite of the absence of working capital, already proves that there is a tremendous field in this country right now for just such a journal as EVOLUTION. Every friend of science is invited to co-operate with EVOLUTION, so that it may measure up to the fullest possibilities of usefulness.

OUR POLICY

In view of the fact that this issue of EVOLUTION is going to nearly twenty thousand readers who have never seen it before, we reprint the following editorial statement from our first issue:

"EVOLUTION will be non-political, so that ALL upholders of academic freedom can support and use it no matter how they differ on other issues. It will be non-religious, never making any effort to reconcile science with religion. Nor will it make atheism its mission. It will carry the positive message of facts from every field of natural science and leave it to the reader to make his own mental readjustment."

The favorable reception accorded to this announcement convinces us that this policy will develop a large field of usefulness for EVOLUTION. With full realization of the difficulties involved, EVOLUTION will endeavor to hew to this line.

OUR COVER

The picture on the front cover of this number of EVOLUTION is reproduced in advance of publication by courtesy of G. P. Putnam's Sons from the frontispiece of "Our Face from Fish to Man" by Professor William K. Gregory.

THE GREATEST IN HISTORY

The convention of the American Association for the Advancement of Science and its forty-seven Associated Societies to be held in New York December 27th to January 2nd promises to be the greatest gathering of scientists that the world has ever known.

It has the opportunity to make itself not merely the greatest in numbers, but the greatest in influence and achievement. The old attitude of considering science and learning as something apart from the life of the people is happily passing away. There is a growing sense of social responsibility among men of science. This should not be repressed through considerations of "diplomacy." It should be encouraged to express itself, and grapple with problems regardless of prejudice.

Specifically, the problem confronts this organized gathering of the most prominent men of science what to do about the challenge thrown down by organized religious fundamentalism. The fundamentalist tactic of appealing to popular referendum is stirring the deeps of bigotry, is bringing into action a tremendous reservoir of ignorance that has been latent. Aroused, it may become an overwhelming flood. This problem can not be solved by ignoring it. It must be met. If this convention will frankly face the facts and mobilize its mighty power to meet them, then indeed it will be epoch making and deserving of the title, "The Greatest in History."

PERNICIOUS PRACTICE EXPOSED

On the opposite page we present the first of a series of articles by Barrow Lyons, New York journalist, dealing with the general modification of biology school texts to suit the fancies of fundamentalists. EVOLUTION will expose this pernicious practice of publishers who prostitute themselves for profit.

As an individual the author of scientific texts is helpless before them. But through their organizations scientists might wield a power that would offset the baneful influence of organized fundamentalism and encourage publishers of text books that tell the whole truth.

It is to be hoped that the American Association of University Professors, which has on the agenda of the coming New York convention the subject "Recent Problems of Academic Freedom," will take note of this situation and propose some action.

CONVINCING PROOF

The original study by J. Leon Williams on "New Evidence of Man's Relationship to the Anthropoid Apes" as published in the April number of the Journal of Dental Research, from which our leading article is taken, contains a mass of most convincing detail accompanied by fifty-two illustrations. It took the form of a rather sharp criticism of certain statements made by Henry Fairfield Osborn in his recent book "Man Rises to Parnassus," in which he argues against man's descent from ape-like ancestors. In this Dr. Williams allies himself with Prof. Wm. K. Gregory, Sir Arthur Keith and other prominent men of science, who endorse the theory of man's close relationship to the apes, which is more and more generally accepted by the scientific world.

UNCONSTITUTIONAL?

Somehow we fail to get excited over the question of whether the Arkansas anti-evolution law is constitutional or not. The point should be carried through the courts to be settled once and for all, and we hope of course that this law will be found unconstitutional. It would make it much more difficult for organized bigotry to interfere with freedom of teaching on a state-wide scale.

But we know that even without such a law fundamentalist school board members will not tolerate texts explaining evolution and that they bring up the children in superstitious fear.

To us the great problem is not the constitutionality of the law, but how to educate the people so that they would not vote for such a fool law. This can not be accomplished by a court decision. It is a slow and unheroic task and will not appeal to searchers for the limelight. But it will appeal to every real lover of freedom to teach the truth, it will enlist every earnest fighter against intolerance and superstition.

HOLD FEBRUARY SEVENTH OPEN

A debate is being arranged between Prof. Joseph McCabe and Rev. W. B. Riley on the subject EVOLUTION—FACT OR FAKE? to take place in New York Thursday February 7th. Friends of EVOLUTION, around New York should make no conflicting engagements for this date. Mark it in your calendar and keep it open. Details will appear in next issue of EVOLUTION.

AT LEAST HE'S NO PUSSYFOOTER

Charles Smith, back on his job in New York and looking none the worse for his three weeks starvation on the Arkansas front, reports with a chuckle: "They kept me busy down there painting signs. As fast as I could make 'm they tore 'em up. But every time they tore one up, I made a new one and bigger."

The Great Crime Against Education

An explanation of why the big text book publishers have taken evolution out of biology.

By BARROW LYONS,

If Europe laughed at America when it learned that there were backward sections here where the teaching of evolution was contrary to law, it will howl and guffaw when it learns that the influence of those backward sections has eliminated the mention of organic evolution from most of the biology school books in the United States.

That the fundamentalists have succeeded in aborting virtually all of the biology texts that are placed in the hands of school and highschool children is the testimony of the largest publishers of texts in this country. What is more, the publishers are so afraid of the fundamentalists that they dare not speak out.

The situation is simply this: text book publishing is a business. It is not conducted for uplift, for reform or even for educational purposes. The publishers have all the education they want, but not all the money they want. They run their businesses to make money. When they publish text books that offend any large section of the purchasing public they limit their sales. Limiting sales means increase in production cost. Increasing sales means lower cost and selling price or larger profit.

Text books are sold by price as much as oranges or radiators. School boards prefer to purchase at the lowest prices. The opinions of teachers do not always bear great weight with the purchasers of the books.

The text book publisher who can sell over the widest range of territory has a distinct commercial advantage over the publisher whose field is limited and whose books are slightly higher priced. Thus even the liberal publisher is forced to concede a great deal to the least liberal elements in the community at present.

Notice, we said "at present." If there were an extensive and insistent demand for text books which taught evolution, more of such text books would be published. One of the objects of presenting this situation to the public is to stimulate the demand for books which tell the whole truth.

WHAT PUBLISHERS SAY

But hear the testimony of the publishers themselves. First, one of the most courageous of large text book publishers.

"Please have it understood at the beginning," this editor commenced, "that the name of our company, or my name, or anything which would tend to identify us is not to be used in your article. It would do the sale of our books no good if the reactionary elements were antagonized. We cannot, as publishers, afford to get mixed up in any controversy."

Staring this man in the face were the bigots of Arkansas, Tennessee, Mississippi, Alabama, Louisiana, Kentucky, Georgia, Texas, Oklahoma, South Carolina, North Carolina, etc.

"Competition makes it imperative that we produce books which can be sold in territory where evolutionary theory is not acceptable to those who control public opinion," he continued. "There are, of course, sections of the country where books which recognize evolution cannot be sold. While I would not say that none of our books have been altered to suit the anti-evolutionists, I can state that this has never been done unless the author was entirely willing.

"We have a text book on biology, which does not contain a chapter on evolution. It has had a great success in the states where evolutionary theory has been under a cloud. In other states it is by no means the preeminent success it has been in the South. In a sincere inquiry as to why this book was not selling better in northern states we consulted our sales force some weeks ago. It was the opinion of some of our salesmen that if the book contained a good, stiff chapter on evolution it would go better in their territory.

HOW AUTHORS ARE PERSUADED

"I believe this firm, has shown a great deal more courage in such matters than most firms. The utmost we have done has been to suggest to the author that *mention of evolution was irrelevant to his book and that its omission would increase the book's sale.*"

Needless to say, this publisher chafes under this condition. He sees other large publishers yielding supinely to the influence of benighted crusaders—men whose ill informed minds seethe with superstition and prejudice, and whose influence is poisoning American thought. He sees such publishers gaining the big advantages in trade, increasing their gains at the expense of sound education, doping the minds of American children everywhere.

"You will be doing a great service to publishers who regard their calling as a public trust, who consider themselves a real part of our educational system, if you will call this situation to the attention of the public," this editor declared. "There is too great a tendency to acquiesce entirely to the opinion of Fundamentalists. But let me ask you again, that our company's name be left out entirely. A publisher has virtually nothing to gain by letting it be known that he has endeavored to take a progressive stand, and everything to lose."

If you feel that the stand of this publisher is not entirely fearless, consider the testimony of the next man interviewed. He is editor for a very large house, which publishes text books only. Naturally he obtained immunity against being quoted.

"No one in this company can speak for publication simply because we cannot afford to get into any controversy," he explained. "Our business is to publish books. All of our books, whether on history, religion, economics or science are so written as to give offense to no faction.

"For instance, our history books dealing with labor problems must be particularly careful to make no statements that will offend either capital or labor. The trouble starts, as a rule, when some child goes home and tells his parents what the teacher said or what he read in his text book. When that offends someone the fireworks begin. So we make it a fixed policy with all of our books, either to avoid entirely subjects that offend, or else, in some instances, state what both sides maintain to be the facts, showing no bias either way."

THE TRUTH SUPPRESSED

The thing this publisher is doing seems to me one of the greatest crimes that can be charged against any educational system —the suppression of the truth as seen by the ablest minds who have examined it. We have inherited the accumulated superstitions of the ages. A thousand influences prevent men from thinking fearlessly and straight. It is only as new knowledge is brought forward that the thick mists of ignorance and misunderstanding from which human beings have suffered are gradually swept away. If the facts as they are brought forward and substantiated by science are not presented clearly to young people there is little hope for progress. Yet this great publisher declares:

"We would be foolish to adopt any other policy. One cannot fight prejudice and our sales would immediately drop off if we attempted to. We are one of the largest publishers of text books in the country, but we could not hope to continue to be if we laid ourselves open to the criticism of trying to give people what they don't want. "If any large group of prospective purchasers object to statements in our books, we could hardly expect to sell these books in sections where those statements are not tolerated.

"Virtually all text books on the market have been revised to meet the demands of the Fundamentalists. In some instances, however, practically all of the evolutionary material has been kept in the books, so camouflaged as not to give offense, the word evolution being eliminated."

How one man, who offered his testimony at the famous Scopes trial in support of that teacher, has written such a camouflaged text, will be told in my next article.

I shall also show how important biology texts have been altered to suit the demands of Fundamentalists, so that the majority of school children are being taught biology from books which do not mention, by name at least, one of the most important biological truths that modern science has established.

NEXT ISSUE DATED AHEAD

The next number of EVOLUTION will be out within three weeks, and will be marked Vol. II, No. 1, January 1929. This is to make the volume co-incide with the year and to have the advantage of pre-dating. Of course every yearly subscriber will receive full twelve numbers.

Twigs from the Family Tree

By N. K. McKechnie,

Millions of years ago a forest fire drove a family of our tree-dwelling ancestors apart. Most of them escaped over a mountain pass into a warm and hospitable forest land, but two youngsters, who had become separated from the others, were forced by the flames to seek refuge in a deep water-course.

SECOND INSTALLMENT

BITTER indeed was the lot the fire had brought to these, and evil the days that they must endure. Only in the stream-bed that had been their refuge was any vegetation found, and that not of a nature to afford them sufficient sustenance. They eked out its scanty provender with distasteful shell-fish and occasionally a find of turtles' eggs, and wandered on and on until the brook they were following emptied itself into a larger stream, whose farther bank was clothed with trees. Drawn by irresistible desire they essayed to cross by leaping from rock to rock, and here one of the little creatures met his fate. Weakened more than his brother by a month's privation he failed to make good the widest gap and was swept away. But the survivor reached the opposite bank and springing into a walnut tree ate his fill for the first time in many a long day.

For over a year he wandered solitary along the river valley while his little ribs clothed themselves with flesh again and his rough coat once more became sleek and smooth. Food was abundant, and he did not know what else he lacked until one day he encountered some of his own kind, a family group resembling the one to which he had belonged.

With joyful chatter he swung himself through the trees to join them, only to be met by a snarling rush of the old male, whose bristling hair and bared teeth showed plainly the newcomer's presence was far from being desired.

The wanderer checked his advance and hurriedly retired. Although he had now reached his full growth and was quite the equal in size of this surly family head, the habit of subordination to his own father forbade him to dispute a second Daddy's authority. Disconsolate he watched from a distance the gambols of the band and followed them in their rovings day after day, sometimes making timid advances of friendship towards a straggler, that were always cut short by menacing Daddy.

On this being repeated again and again a new emotion began by fits to sway the wanderer's spirit. Sometimes after being chased to a distance by the troop-guardian he would relieve his feelings by futile, unregarded chattering and gnashing of teeth; sometimes while he watched the band at play he would seize the branch on which he stood and shake it until the dead twigs fell in showers; sometimes even his rage would so possess him that he would erect his hair, stiffen his legs till he walked on tip-toe and give a sharp angry bark that infallibly brought the old patriarch upon him, quick to answer the challenge. The wanderer never dared await the onset,—but each time it was more unwillingly that he retreated.

At last came an occasion when he lingered too long and the old male had him driven to the end of a branch from which there was no way of escape. And then suddenly his rage flared up, and he flew open-mouthed at his enemy.

The clash of meeting threw them both off the bough and by sheer luck he was uppermost when they struck the ground, suffered less from the shock than the other, and in a moment was tearing at his opponent's throat. Half-stunned by the shock of his fall the latter made but a feeble resistance and even that faded when a gush of warm blood from a rent jugular welled into the wanderer's mouth. Soon the younger animal felt the body of his adversary grow limp and lifeless beneath him. He worried it a little more, but meeting no response, drew away with a somewhat bewildered air, sniffed inquisitively, looked inquiringly around, became aware of the other members of the band, started towards them, stopped suddenly to look back at his late opponent,—there was no prohibitory sound or movement,—and there and then forgot the past and leapt to meet his new play-fellows.

He was a long way the biggest and oldest male of the troop (owing to the stern disciplinary code of its late leader) and in few weeks' time he was proving himself a worthy successor to the patriarch; —no less than five too-precocious youngsters had been forced into exile!

He thus laid the foundation of a long and safe rule, and begat a numerous progeny. For millions of years his descendants lived and died, becoming numerous when their environment favored them, dying out when it did not, but always leaving survivors adapted to new conditions.

And so in this way the descendants of the Wanderer changed. They became bigger, heavier, less at home in such trees that remained, more inclined to the solid ground. And because they had formed the habit of rising on their hind legs when they reached to a bough above their heads, so they found it often convenient to do so when on the ground, and their feet began to accomodate themselves to the change. And their hand-like front paws came more and more to be used for handling things, and so much the less for bearing the weight of the body while walking. And with the increasing use of the hand came more exercise for the brain, and that again found more work for the hand to do.

Thus it was when, perhaps a million years ago, the first of the ice-ages closed like a hand of death upon their world, they had already become men. The successive glacial-periods were the final testing times by which they were perfected. For times of trouble were always their times of growth,—when they did not die! They sheltered in caves when the first ice-age came, naked hairy long-armed creatures with a stooping shambling gait, whose only tools were clumsy stones held in the hand; they left them at the conclusion of the final one erect, clothed, of a stature and brain equal to our own.

And from that time to ours their history is known. We are their final descendants.

* * *

But of the Wanderer's blood relations who by chance (merely by chance, it would seem) found their way to the lush country on the southern side of the mountain range, a far different story is to be told.

Not for them the stern discipline of an increasingly unfavorable environment with resultant demands upon their latent powers of adaptation. For millions of years no need arose for them to modify the way of living of their fathers. Only their increasing size and weight made them less free of the slenderer-branches of the trees; nearer the ground they must descend, until finally it suited them to come and go entirely upon the forest floor, only ascending the trees to sleep in safety at night. And such was their size and terrible strength when full-grown that even this was unnecessary for the adult male. Secure he slept at the foot of the tree in which his family was established and no night-prowling flesh-eater dare molest him.

But something of the primeval warmth was departing from the earth and as the slow milleniums passed he traveled unconsciously southward through the endless forest to where the sun had fuller power.

It was in the later stages of his long journey that life for him began to be disquieted. Still disregardful of the flesh-eating animals and fearing them not, he was met occasionally now by a strange creature that walked upright as he did and resembled him somewhat, though of much slighter build. True, this newcomer fled hastily at sight of him if the encounter took place in the bush, but sometimes if he had led his band to a feast on the succulent herbs that often grew near the new creatures' dwelling-places, these mysterious beings would appear in great numbers and unprovokedly attack them. And they had the power of stinging unaccountably from distance. So their neighborhood became places to be avoided, which meant a constant shifting of feeding grounds, because the newcomers seemed to be spreading over the whole earth.

Menaced by this invasion that they knew not how to combat, faced indeed now at the end of their time by a test infinitely more stern and swift of action than any that the Wanderer's progeny had had to endure, the forest-folk withdrew deeper and deeper into the as yet uncoveted places of the jungle.

Would you like a glimpse of them at the present day?

(Concluded in next issue)

THE AMATEUR SCIENTIST

A Monthly Feature *conducted by* Allan Strong Broms

BIRDS' FEET

The delightful thing about science is that it explains plainly the mysterious facts we see about us. It teaches the eye to see facts and read solutions. Take birds' feet, for example. Offhand, the amateur would think of them as more or less all alike, but really look at them once with the eyes of science and you will know them ever after as of distinct types, each telling a story of the life of the bird. For each bird has feet that fit its way of living, and by their feet you shall know them.

In the picture are seven kinds of feet, each used in a characteristic way. (1) The shag or cormorant has a webbed foot for swimming, as it lives the life of a fisherman. (2) Quite different is the foot of the tree dwelling crow, the toes being long and curved for grasping the branch on which it perches, one of the toes being moved back to encircle the branch from the opposite side. (3) The Ptarmigan lives on the treeless barrens of the arctic regions, and has a foot broad and padded for running and well wrapped in a warm stocking of feathers. (4) The wild jungle fowl needs no stocking to keep warm, but it does walk and stalk about, its flatly spreading toes helping it keep its balance. The fourth toe is lifted a bit and sharpened into a spur, a handy weapon in the jungle battles over some fair hen. With the other toes it scratches a living for the family. (5) The coot or mud-hen just lives in the water, its lobate-webbed feet making good oars for fast swimming and diving. (6) Jacana leads a strange life, walking on floating leaves, its weight well distributed by its long, wide-spreading toes. (7) The strong, curved talons of the sea-eagle tell the whole story of its predacious habits, its swift attack on its fish or other victim, claws striking hard to kill and digging deep to hold and carry off the flesh food it brings home to its family.

Each has its own way of life and its body parts fitted to that life. It has found a place in the affairs of the world and by varying to fit that place it has survived in the struggle for existence. As each found a somewhat different place (environment), there result unlimited varieties, and species and broader groups, each adapted in structure and habits to the conditions into which it grew.

ICE SIGNS

These late fall days of barren hills are good for amateur geologising. The air is bracing, walking is fine and most of you live within the glaciated area shown on the map, within which there is no end of signs of the great, mile-thick ice sheet that covered four million square miles of northern North America within quite recent times. Only one small section in Illinois, Iowa, Minnesota and Wisconsin was not touched by the ice. Europe also had its ice sheet centered in Scandinavia and spreading out over Germany and the British Isles. Perhaps there was but one great ice sheet over the two continents which were then closer together and have since drifted apart. Certainly, however, the ice-cap now covering Greenland is the remnant of the continental ice-sheet that spread from several Canadian centers.

The signs are on the surface and easy to read; clay mixed with boulders and pebbles and sand, heaped into small, rounded hills, just as it was dumped by the melting ice, with little or no water sorting such as we find in water-laid strata; chains of irregular, shallow lakes connected by short streams that wander aimlessly over the topographic maze. Some of the boulders are strangely unlike the rocks native to the neighborhood, and very like other rock beds tens, even hundreds, of miles northward, from which they were quarried and carried by the moving mass. The bed rock itself may be planed, or grooved, or scratched by the heel of the moving ice sheet, a heel full of hob-nail rocks frozen to the sliding glacier bottom.

Ice-sheet centers: I, Cordilleran; II Keewatin; III, Labradorean; IV, Newfoundland.

LOOKING BEFORE AND AFTER

By Joseph McCabe

Someone once defined man as the animal who looks before and after. It is not a bad definition, for all the claims that a bird or wasp, for instance, looks forward, when it builds a nest to its coming progeny, are now disallowed. It requires the higher type of mind which distinguishes man to forecast the future and build up a constructive and entire picture of phases of the earth which have passed away. The chief defect of the definition is that it leaves so few of us really human. Most of us live in the task or the entertainment of the hour.

At the most we know only of the past that our political party won a great victory in the year so-and-so, and of the future only that the football or baseball season opens on such a date. It is a slight improvement on the psychology of the sheep, but it argues some defect in the costly scheme of education which has spent seven or eight laborious years on us.

But if we take the human mind in its higher representatives, the men of science, we seem compelled to say that in the last century or so it has made a prodigious rise in the scale of intelligence. Young men sometimes severely rebuke me after my evolutionary lectures and point out that "there has been no improvement in the human mind for the last twenty thousand years." They picked this up in the works of certain American men of science, not one of whom is an anatomist, and each of whom, has a theological bee in his bonnet. You know what their idea is. Cro-Magnon man, of the late Cave Period, has so large a brain—I won't repeat the dreary catechism. Whatever clues to the texture of the brain—the size alone tells nothing, for only a few ounces of the brain are involved in intellectual operations—an ancient skull may give, it certainly cannot prove the precise power of thinking of the dead man.

The real meaning of this eccentric opinion is "spook-stuff." These professors are not really concerned about the comparison between the brain of Cave Man and ours. They are comparing it with the brain of his predecessor; and they are simply trying, by a desperate twist of the scientific evidence, to prove that the mind made so miraculous an advance in the last phase of the Old Stone Age that evolution cannot explain it, and we must admit the appearance on the scene at last of a real spiritual soul.

Probably the highest achievement of the modern mind in the way of looking before and after is a certain vast mathematical conception of the universe.

I will tell you in my next article why this mathematical estimate of past and future time seems to me so full of important human interest that I would spend months, if necessary, to see that every child was thoroughly and intimately familiar with the outline of it before it left school.

The War Against Evolution

By MAYNARD SHIPLEY

Now that the smoke is clearing away from the Arkansas battlefield, and we are able to count the dead and wounded of that temporary defeat, it behooves every "soldier in the liberation war of humanity" to look about him and make plans for the coming campaign. For the war will not be over until either the Fundamentalist enemies of science have acknowledged the loss of their bigoted cause, or until all that modern civilization owes to pure and applied science has bowed its head under the heel of fanaticism and ignorance.

The first thing to consider is Arkansas itself. An initiative act cannot be vetoed by the governor; the only way to repeal it, short of another popular vote, which does not promise well, is by three-fourths vote of the legislature. Various agencies are contemplating the bringing of test cases to challenge the constitutionality of the law. In Tennessee the Scopes indictment was so brought that this was impossible; and in Mississippi no test case was ever made. In Arkansas it is possible to work for such a test, which would become a rule for other states also menaced by anti-evolution legislation. Most of the tests considered involve the martyrdom of a teacher. The Science League of America is considering a plan, which would lose no teacher his job, but details cannot be given at this time.

In the meantime, what of the other states? There will be 43 state legislatures in session in 1929, as against nine in 1928. The avowed plan of the Fundamentalists is to bring the usual anti-evolution legislative bill in as many as possible and if the Lower House or the Senate should prove "recalcitrant" and refuse to pass the measure, to have recourse, wherever possible, to direct legislation. Nineteen states besides Arkansas have the initiative and referendum system, and a number of these will hold legislative sessions in 1929. The east and north are by no means being neglected by the Fundamentalist anti-evolutionists. They are, however, most actively at work at present in Oklahoma, Florida, Colorado, and Kansas.

This method of bringing a question of science to the direct vote of the uninstructed lay citizen, tried successfully for the first time in history in Arkansas, holds grave dangers to the cause of scientific freedom. There is small doubt that if a general referendum on the subject of teaching evolution in tax-supported schools were held tomorrow, it would win in many—perhaps most—states. The great mass of the uneducated public is very strongly under the influence of anti-scientific and anti-liberal teaching. And if two thirds of the states should ban the teaching of evolution, a Federal constitutional amendment would become not only possible, but probable.

In this crisis, it is the immediate concern of everyone who values what modern science has achieved, and its right to continue investigation and instruction, to come up and be counted. Magazines like EVOLUTION and organizations like the Science League of America are standing firmly against this invasion of ignorance. But they must have the moral and material support of *all* friends of science and of freedom if they are to be enabled to do the work for which they were started. The situation is no longer a laughing matter; the war has just begun in earnest; and every man and woman who is on the side of the twentieth century in thought and teaching must lend his personal aid lest America be dragged back from the twentieth century to the darkness and ignorance of the tenth.

THREE QUESTIONS

By popular referendum Arkansas has just adopted a law to prohibit the teaching that "man is ascended or descended from a lower order of animals." In view of the avowed purpose of fundamentalists to force anti-evolution laws to popular vote in nineteen other States, EVOLUTION submits the following questions to members of the American Association for the Advancement of Science, under pledge to keep individual ballots confidential:

	Yes	No
1. Should teaching that "man is ascended or descended from a lower order of animals" be prohibited by law?	——	——
2. Should the American Association for the Advancement of Science take a militant attitude against fundamentalist anti-evolution laws?	——	——
3. Should the American Association for the Advancement of Science express itself against the elimination of evolution from biology school texts by publishers in fear of fundamentalist influence?	——	——

If any reader who is a member of the above organization fails to receive the special questionaire he should write his vote on any sheet of paper and mail it with name and address to EVOLUTION, 96 Fifth Ave., New York before December 20th, so that it can be counted in the compilation. The result will be published in the next issue of EVOLUTION, but individual ballots will of course be kept strictly confidential. Those who wish to write comment for publication should do so on separate sheet of paper, and make it as brief and to the point as possible.

LAST THOUSAND PLEDGED

A friend who has already contributed two hundred dollars during the past year has pledged himself under the name of L. T. B. Light to contribute the last thousand dollars to our five thousand dollar EVOLUTION PROMOTION FUND when the other four thousand dollars has been paid in. Morris Weinberg has promised $200 when the balance of the fund is raised. The amounts paid in to date are:

Reported last issue, $735.00; B. Levett, $30.00; Horace Wood II, $10.00; M. Mark, $50.00; Martin Dewey, $200.00; Wm. K. Gregory, $100.00; J. Leon Williams, $50.00. Total received $1175.00. Pledged $1200.00. Grand total, $2375.00.

This puts us almost to the half way mark. We feel sure that enough of our readers realize the importance of launching an energetic subscription drive RIGHT NOW to make up the balance of the $5,000 fund needed this month.

As stated in our last issue, a share in Evolution Publishing Corporation will be issued for every ten dollars paid in, and an extra share of voting stock with every fifty dollars. Since EVOLUTION has no "angel" we use this method for raising the necessary capital for its promotion. If you would like additional information we shall of course be very glad to furnish it.

HONOR ROLL

This month the list of those who qualified for the Honor Roll by sending three or more subscriptions is short. All the more respect to the good warriors listed here, who were busy on the firing line.

36 A. W. Watwood	5 C. D. Foreman
19 Fr. Masek	5 W. H. Abel
17 Ewald Carlson	4 Alla S. Broms
10 Paul B. Mann	3 Karl Froding
9 F. Cassidy	3 Gustave Weiss

Watch this list grow next time. The battle is developing and a lot of our friends are getting into action. Mobilize yourself and tackle your friends and neighbors. Many of them have now read something in the papers about Arkansas and will be interested to know what the fuss is all about. Others will have heard of the Tennessee baby with a seven inch tail, and will be in the mood to read more. Every subscriber we gain is forever lost to the funnymentalists. Up and at them.

SALUTE FRANK MASEK

One of our readers who never wearies of spreading the light is Frank Masek of Illinois. Seven times in succession he has merited the Honor Roll. His first list of five subscriptions for EVOLUTION was reported in our fourth issue. Since then he has sent seven, five, five, twenty-one, nineteen, and this month again nineteen. And his lists show that these are real subscriptions. He meets them face to face and makes them "sign on the dotted line," which means that they will also read it. A hundred front fighters like Masek will soon make EVOLUTION a power and put the funnymentalists on the run.

THE COMING CONVENTION

From the November 30th issue of Science we glean the following information about the coming convention of the American Association for the Advancement of Science and Associated Societies.

It will be held in New York from December 27th to January 2nd inclusive, and "promises to surpass all earlier meetings in scope, in attendance and in importance to American science." The organization has over 17,000 members and invites not only professional scientists but all who are interested in the advancement of science to join. Entrance fee is $5.00; annual dues, also $5.00, include subscription for Science. This may be paid at the time of registering for the convention. Attendance however is not limited to members; all interested are invited, but every one must first secure a certificate from the registrar. Members pay a registration fee of $1. for the convention, non-members $2. The main registration office is in University Hall, Columbia University. Branches at the American Museum of Natural History, Metropolitan Museum, American Geographical Society Bldg. and the Engineering Building (29 W. 39th), all open from 9 to 6 daily.

The convention is really a large group of conventions held simultaneously, as all forty-seven associated societies will convene during this week. The plan in general is for the subsidiary sections and societies to hold their sessions in the forenoons and afternoons, in various Hotels and Meeting Halls, while each evening there is a General Session and Reception in the large Auditorium of the American Museum of Natural History. Space forbids itemizing the tremendous program arranged for all these meetings but the program for the General Sessions is to be as follows:

Thurs. Dec. 27, Dr. Charles P. Berkey, Columbia University, "Recent Discoveries in the Geology of Mongolia."

Fri. Dec. 28, Arthur H. Compton, University of Chicago, "What Is Light?"

Sat. Dec. 29, Wm. Morton Wheeler, Harvard University, "New Tendencies in Biologic Theory."

Mon. Dec. 31, Arthur A. Noyes, Calif. Inst. of Technology, "The Story of the Elements."

Tues. Jan. 1, Harlow Shapley, Harvard University, "The Gallaxies of Gallaxies—New Developments in the Study of Superorganizations of the Milky Way."

Sunday afternoon, Dec. 30th, there will be a concert by New York Philharmonic Society in Carnegie Hall, and in the evening a reception at the Metropolitan Museum.

Numerous other General Sessions are also being arranged. The full program makes up a book of over 300 pages and will be mailed to non-members for seventy-five cents by the Secretary's office, Smithsonian Institution, Washington, D. C.

A list of the Sections into which the organization is divided, and in which the affiliated societies are grouped, gives a slight idea of the scope of the work: A. Mathematics; B. Physics; C. Chemistry; D. Astronomy; E. Geology and Geography; F. Zoological Sciences; G. Botanical Sciences; H. Anthropology; I. Psychology; K. Social and Economic Sciences; L. Historical and Philological Sciences; M. Engineering; N. Medical Sciences; O. Agriculture; Q. Education; Miscellaneous.

Proposals for the consideration of the convention should be sent to the Secretary's Washington office before Dec. 20th, or handed in personally at the main registration office in University Hall as early in the meeting as possible. They should be "in finished and carefully worded form," and are then first referred to the Executive Committee, which meets in the Lincoln Hotel each morning at ten o'clock. The Council of the Association holds its first session in the Library of the Lincoln Hotel Thursday Dec. 27 at 2 P. M. Election of officers occurs Saturday morning.

During the time of the convention there will also be a SCIENCE EXHIBITION in University Hall at Columbia. The greatest and most comprehensive display yet held is promised of scientific apparatus, materials, methods and books, as well as a large number of non-commercial scientific and research exhibits. This exhibition also "becomes a sort of social center, a place where friends and acquaintances may meet and exchange ideas."

To any one interested in science, which of course includes every reader of EVOLUTION, this convention will certainly be worth a trip across the continent. Tickets may be purchased at nearly all points from Dec. 16 to 26, depending on distance from New York, entitling the holder to half fare on the return trip provided a "Standard Certificate Form" reading for the New York meeting of the "American Association for the Advancement of Science and Associated Societies" is secured at time of purchase. We hope that many readers of EVOLUTION will take advantage of this opportunity to visit New York, and that even during this week replete with science programs they will remember that the latch string is also hanging out at our EVOLUTION office.

IN THE JUNGLES OF TENNESSEE

O, poor old Tennessee,
The original "monkey" state;
It looks like irony,
Like the very hand of fate,

That she, of all the world,
Should be the first to hail
The birth of a baby girl—
With a seven inch simian tail!

Let's all chip in and offer a hundred dollar prize for the longest tail "growed" in Arkansas. I believe she can beat Tennessee by at least two inches.

—BOB LYLE.

LET IT BE BOOKS

Don't let the question of what presents to send to your friends give you any more headaches. Stop worrying about it right now, and decide to send books.

There really isn't any more appropriate and acceptable gift. A good book is always welcome. And it has an influence altogether out of proportion to production costs and price. The reading of one good book may transform an entire life.

The reading of a book of the kind listed below opens a new window in the mind. It lets in light, and forever after enables the reader to look out and see and understand more of the world. Thus, when you present such a book to a friend you benefit both him and yourself. Its reading will enable him to live a larger mental life, and it will make him a more interesting companion to you.

And remember that, no matter how "well read" you are, this also holds true for you. So please don't stop with your friends, but make yourself a present too. Certainly, LET IT BE BOOKS.

In addition to the titles listed below, we will be glad to send you any book in print at the publisher's price.

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96 FIFTH AVE., NEW YORK, N. Y.
Send the items checked to undersigned:

THIS PUZZLING PLANET: Edwin Tenney Brewster	$4.00
A B C OF EVOLUTION: Joseph Mc Cabe	1.75
GROWING UP: Karl de Schweinitz	1.75
HEIR OF ALL THE AGES McKechnie:	3.50
PICTURE BOOK OF EVOLUTION: Dennis Hird	3.75
CREATION BY EVOLUTION: Edited by Frances Mason	5.00
THE BRAIN FROM APE TO MAN: Frederick Tilney	25.00
LET FREEDOM RING: Arthur Garfield Hays	2.50
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EXPLORING THE UNIVERSE: Henshaw Ward	3.50
DARWIN, THE MAN AND HIS WARFARE: Henshaw Ward	5.00
WAR ON MODERN SCIENCE: Maynard Shipley	3.00
MY HERESY: Bishop Wm. M. Brown	2.00
CONCERNING MAN'S ORIGIN: Sir Arthur Keith	2.00
HISTORY OF WARFARE OF SCIENCE WITH THEOLOGY White (2 vols.)	6.00
OUTLINE OF MAN'S KNOWLEDGE: Clement Wood	5.00
SCIENCE VS. DOGMA: C. T. Sprading	1.50
MICROBE HUNTERS: Paul de Kruif	3.50
WHY WE BEHAVE LIKE HUMAN BEINGS: George A. Dorsey	3.50
ORIGIN OF SPECIES: Darwin	1.00
MAN'S PLACE IN NATURE Huxley	1.00
CREATION: NON-EVOLUTIONARY THEORIES: Brewster	3.50
RIDDLE OF THE UNIVERSE: Haeckel	2.50
THE BIBLE UNMASKED: Joseph Lewis	1.15
THE STORY OF THE INQUISITION	3.20
EVOLUTION: Monthly, One Year	1.00

(Write VERY plainly)

Amount enclosed $.....

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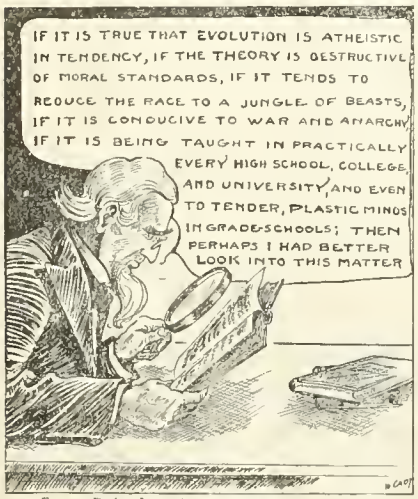
FUNNYMENTALS

"Before the animals were made to pass before Adam to be named, God determined to make another being like him, because He knew that none of the animals were fitted by creation and nature to be his real companions. *They* were simply animals; *He* was a rational human personality constituting a genus all his own. Then the animals passed before him, and he gave them appropriate names. "But for man himself," the translator aptly puts it, "no helper was found who was like him." So God made another personal being of the same genus from the original generic human stock, thus performing at the same time two great crucial biologic acts,—the preservation of the unity of the human race and the differentiation of sex.

"And this, we maintain, as we have often done before, is the most rational and scientific way of accounting for the origin of *genus homo*," Professor Leander S. Keyser, D. D., in Bible Champion, Dec. 1928.


IF IT IS TRUE THAT EVOLUTION IS ATHEISTIC IN TENDENCY, IF THE THEORY IS DESTRUCTIVE OF MORAL STANDARDS, IF IT TENDS TO REDUCE THE RACE TO A JUNGLE OF BEASTS, IF IT IS CONDUCIVE TO WAR AND ANARCHY, IF IT IS BEING TAUGHT IN PRACTICALLY EVERY HIGH SCHOOL, COLLEGE, AND UNIVERSITY, AND EVEN TO TENDER, PLASTIC MINDS IN GRADE SCHOOLS; THEN PERHAPS I HAD BETTER LOOK INTO THIS MATTER

From Defender (fundamentalist), *Oct.* 28

"The theory of evolution, taught in public schools, is diametrically opposed to the teachings of the word of God, and leads the student to the conclusion that the bible is a book of lies and is utterly undependable, or that the school books are wrong. Teachers are considered by the average scholar almost as infallible as God.

"It is the same as placing a den of rattle snakes in a room with the children. One could not blame a parent for protecting them against a rattler. Can one forbid them from making a stand against this rattler? One kills the body, the other kills the soul. It is to be wondered that parents are able to sit at home as long as they have and know that those things are taught to their little ones." Aimee Semple McPherson, quoted by Chicago Daily Tribune, Oct. 26, 1928.

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Established 1873
GEORGE E. MCDONALD, Editor
Three months, $1. Foreign, $1.15
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FROM OUR READERS

"I've reached the conclusion that Arkansas isn't the only state where anti-evolutionists reside. Illinois has a few also. Proof: One of the above saw my EVOLUTION magazine last month before I saw it, became quite angry at such "heathenish stuff" and flung my magazine into the blazing destructive flames of an old heater.—Amelia A. Kroepel, Illinois.

"As one of the members of Rationalist Press Association I received with great pleasure the distributed copy of your splendid propaganda paper EVOLUTION. It is a first class production which I should wish heartily will have a wide sale on this side as well as in U. S. A. The attitude of the British Press to the famous Tennessee case, by inference suggested that everybody accepted evolution here. This is not so. It is astounding how the average Englishman either completely ignores the subject, or is a bigoted opposer of it. There has been no famous legal test here; the fact remains that Darwinism is NOT taught in our State elementary schools, and very meagerly taught in the best private schools and Colleges. My own children going to public elementary school are taught the origin of Life and the world as per the first chapter of Genesis,—treated literally too. They learn that Charles Darwin was a great naturalist and traveller, who wrote the "Voyage of the Beagle" and was very kind to his family, and that's about all they learn of that.—George Davey, England.

"You are doing very well. Every number of EVOLUTION seems to be an improvement.

"I feel sure that Christian school authorities are directing pupils to take up the dead languages and higher mathematics to the exclusion of the natural sciences with the purpose that they may more easily be led by the churches. Boys and girls are led to study Latin and Trigonometry, who do not know whether their heart is above or below their diaphram; who know nothing of the phases of the moon; who can not analize a flower, and to whom a lump of coal is nothing but a lump of coal.

"I believe this is all done slyly, cunningly, with the purpose of keeping students from studying the sciences that must necessarily lead to knowledge of evolution.

"Enclosed find best wishes and check for fifty dollars, being one per cent of the fund you propose to raise. Yours for Humanity,—M. Mark, Indiana.

FREETHINKERS OF AMERICA
National Headquarters, 5 Columbus Circle. Columbus 7284. Public Meeting, Sunday, Jan. 6th. Rumford Hall, 50 E. 41 St., 3 P.M. At this meeting,
Mr. Philip G. Peabody
champion world trotter, will deliver an address on "His Observations of Forty Years Freethought Throughout the World."— Admission Free.

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ATHEIST TRACTS FREE
"GODLESS EVOLUTION" AND "THE BIBLE IN THE BALANCE"
Write:
American Association for the Advancement of Atheism, Inc.
119 E. 14th St., New York, N. Y.

In The Off Years Wise Men Provide for Times of Stress
Only 9 legislatures met in 1928; 43 will meet in 1929, and many of them will have anti-evolution measures presented before them.
Fundamentalists are planning their campaign; why not evolutionists?
Join the Science League of America now. Help build up its strength. We need your help NOW, that we may not be caught unprepared to defend freedom of teaching and research when the Big Fight starts again in 1929.
Dues $3 a year; life membership $25.
Write for Leaflet and Application Blank.
Science League of America
Incorporated
504 Gillette Bldg., San Francisco, Cal.

From Various Angles

ANOTHER FAMILY ROW
From Chicago Tribune, Dec. 1.

UNDERSTAND- IT'S AG'IN THE RULES FOR ANYONE TO LEARN ANYTHING ABOUT EVOLUTION AN' DON'T LET ME KETCH YOU TRYIN' TO"
GEOGRAPHY
DIAMOND DICK
ARKANSAS ELECTORATE
GEOGRAPHY
EVOLUTION OR DARWINIAN THEORY
GEOGRAPHY

FORBIDDEN FRUIT
From Cleveland Press, Nov. 15

ENFORCE IT, BY ALL MEANS

Some public officials in Arkansas are reported to have let the idea get abroad that the newly adopted anti-evolution law would be allowed to become a "dead letter." Not so the Superintendent of Public Instruction. He will enforce it up to the hilt. Which moves one of our readers, Bob Lyle of Biloxi, to take his pen in hand as follows:

Biloxi, Miss., Nov. 16th, 1928.

Mr. J. P. Womack, State Supt.,
Little Rock, Ark.

Dear Sir:—

I want to congratulate you on the manly stand that you have taken, regarding the strict enforcement of the recently passed Anti-Evolution law.

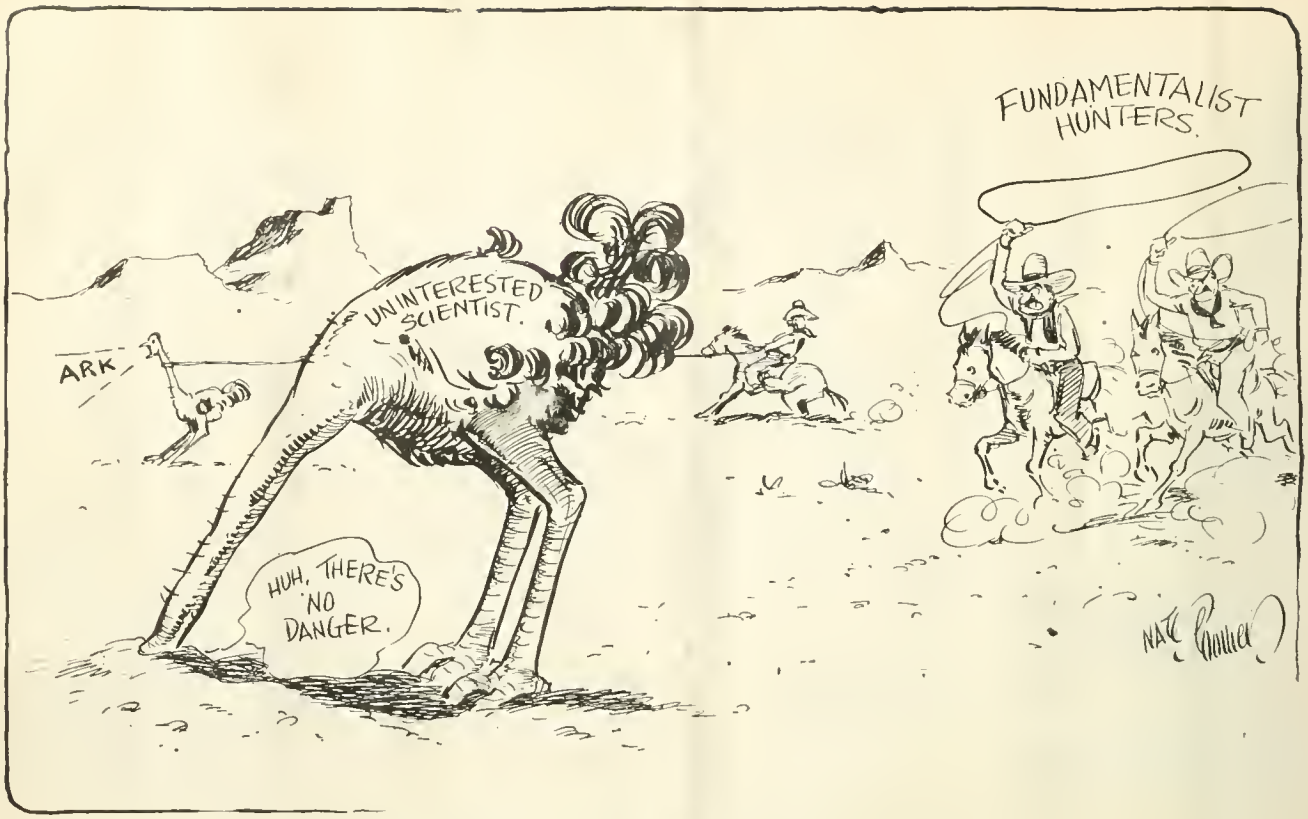
These religious laws that Fundamentalists are having enacted are making us a nation of bootleggers and sneaks. An anti-evolution law makes Fundamentalism the state religion, which is unconstitutional. Not only that, it is a personal insult to every teacher.

Teachers spend years in preparing themselves for their profession, just as the captain of an ocean liner spends years in the study of navigation. Can you imagine any ship captain who would meekly submit to having his crew and steerage passengers put it to a vote, then demand that he throw his compass and charts overboard and steer his ship by the Bible? Then why should people who are as unfitted to teach the higher branches of knowledge as the average steerage passenger is to navigate a ship, be allowed to say what duly licensed teachers shall teach?

I hope that you will stand by your guns and see that this silly law is lived up to, to the very letter. No teacher can take the proper pride in his profession when obliged to stultify his reasoning powers, in order to hold his job. And no teacher can command the respect of his scholars when they know that he is hypocritically dodging the issue by calling evolution by some other name.

Yours sincerely, BOB LYLE.

IT AIN'T BOZO WE'RE SO SKEERED OF!
From Commercial Appeal, Nov. 14.



Will He Wake up in Time?

THE VERY EXISTENCE

of such abysmal ignorance as is evidenced by the adoption of the anti-evolution law in Arkansas is a challenge to every one of scientific training. It is a constant source of danger, for the vote of the least counts as much as the vote of the wisest, and rightly so. This places the

SOCIAL RESPONSIBILITY

on every man of science to pass his information along, not to monopolize what he discovers, but to popularize it and make it common property.

YOU CAN NOT DISSIPATE

the darkness of superstition by pretending that it does not exist, or by assuming an air of superiority, or by finding it unconstitutional. The only way to break the bonds of bigotry is to

SPREAD THE LIGHT OF SCIENCE

In this task EVOLUTION seeks the co-operation of every enlightened man and woman. It hopes to enlist every scientist with a sense of social responsibility and furnishes an effective method for translating this into action. Use this blank.

EVOLUTION PUBLISHING CORPORATION, 96 Fifth Avenue, New York, N. Y. Date .....

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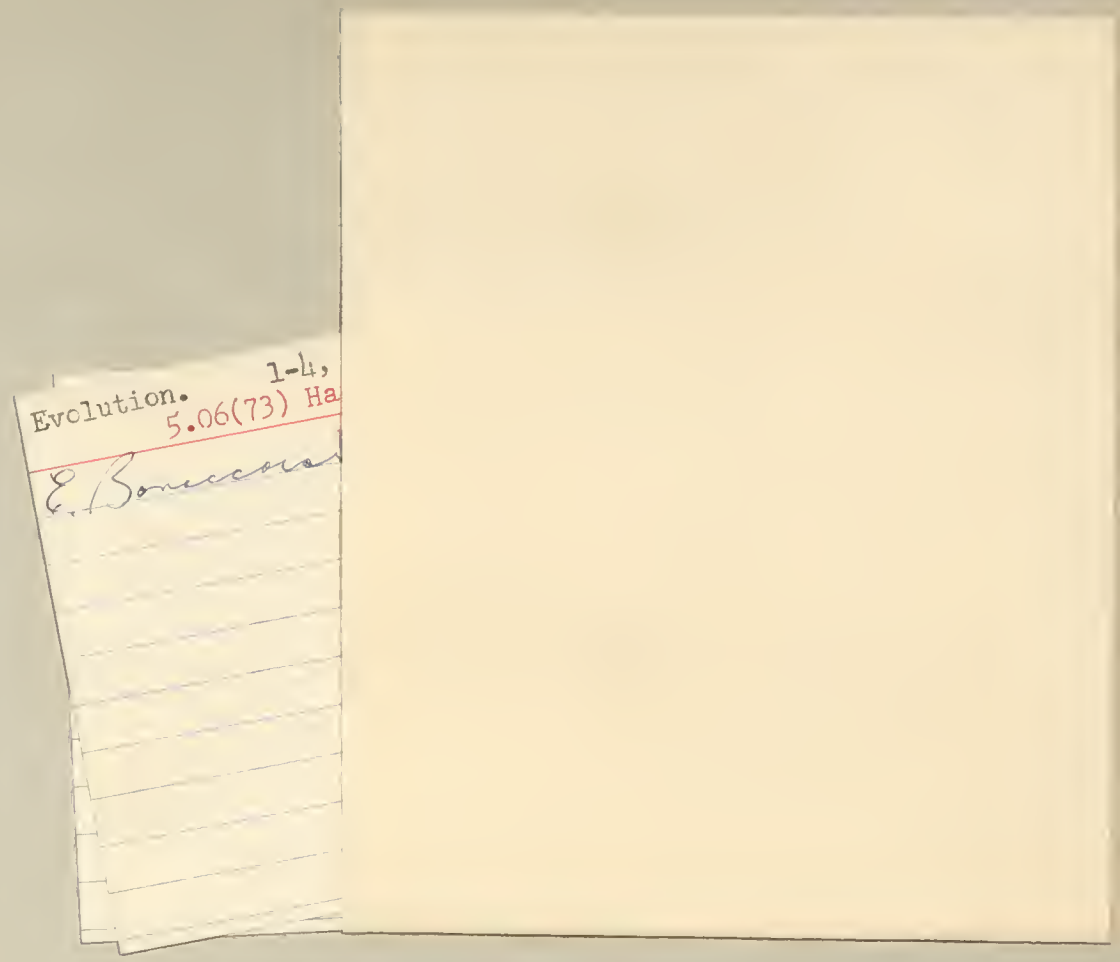
(If you don't want to tear cover, any old sheet of paper will do.)



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